

Materials Sciences Division

Integrated Safety Management Plan

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Materials Safety Division Integrated Safety Management Plan

1. Introduction and Purpose

Integrated Safety Management (ISM) constitutes one of the core principles for the organization and operation of the Materials Sciences Division. The Materials Sciences Division (MSD) has integrated each of the five functions and seven principles of ISM from the institutional LBNL Integrated Safety Plan into its on-going management of the Division.

The five functions are:

- (1) Define the scope of work
- (2) Identify the hazards of the work
- (3) Develop and implement controls for the hazards
- (4) Perform the work as authorized
- (5) Maintain continuous improvement from regular feedback.

These five ISM core functions are sustained by applying the seven guiding principles of ISM:

- (1) Line management responsibility and accountability for ES&H
- (2) Clear ES&H roles and responsibilities for managers and staff;
- (3) Competency commensurate with responsibilities;
- (4) An on-going balance between safety on one hand and research and operational priorities on the other;
- (5) Working within standards and requirements;
- (6) Hazard controls tailored to the work; and
- (7) Authorization basis established for the work.

As a large Division performing laboratory work in 8 buildings at LBNL and managing two user facilities and extensive laboratory space on the UC Berkeley campus, the organization and implementation of integrated safety management is relatively complex when compared to other research divisions at Berkeley Lab (LBNL).

The MSD ISM program meets or exceeds all of the standards described in LBNL institutional policy and procedure documents, including:

- The Regulations and Procedures Manual (RPM, PUB-201)
- The Health and Safety Manual (PUB-3000)
- The Integrated Environment, Health & Safety Management Plan (PUB-3140)
- The Operating and Assurance Plan (OAP, PUB-3111).

This ISM Plan implements the LBNL Integrated Safety Management program within the Division. The plan establishes the mechanisms and management strategies that will ensure that all institutional and Division-specific EH&S policies and procedures are properly implemented. In general, MSD implements LBNL ISM and EH&S policies and procedures without revision, which are thus not mentioned here.

Materials Sciences Division Work on the University of California at Berkeley Campus

Except where noted, this plan applies to work conducted in LBNL facilities but does not apply to work performed by MSD personnel on the campus of the University of California at Berkeley. In accordance with the *Partnership Agreement between UCB and*

LBNL Concerning Environment, Health and Safety Policy and Procedures (March 15, 2004), all campus MSD laboratories implement an ISM program via campus-based mechanisms with the assistance of the campus Office of Environment, Safety and Health.

The requirements described in this ISM Plan apply, as specified, to faculty, staff, matrixed staff, postdocs, students, participating guests, visitors, users, vendors and contractors performing work under the management control of MSD.

2. Description of Division

The Materials Sciences Division conducts materials research motivated by problems in energy science and related areas. The primary thrust of Division research is directed at the design, synthesis, discovery, characterization and use of new materials and the development of ways of making materials, with a strong emphasis in nanoscience.

The Division consists of approximately 680 individuals, a snapshot in 2008 showing the distribution of Division personnel is provided below:

Status of Relationship	Number
Faculty Scientists	54
Staff Scientists	49
Postdoctoral fellows	90
Graduate students	124
Undergraduate students	42
Guests/users	241

Division funding is approximately \$58M per year, of which the DOE provides approximately \$48.5M.

Most MSD personnel work at LBNL, but a substantial minority work on the UCB campus, either exclusively or in concert with their work at LBNL. Work at LBNL is performed primarily in buildings 2, 62, 66, 67, and 72, which are managed by the Division (MSD shares management of B2 with ALS and CSD). In addition, single lab operations are present in buildings 70A and 64 and considerable Division work is performed at the ALS. Work on campus is divided between the chemistry, physics and engineering complexes.

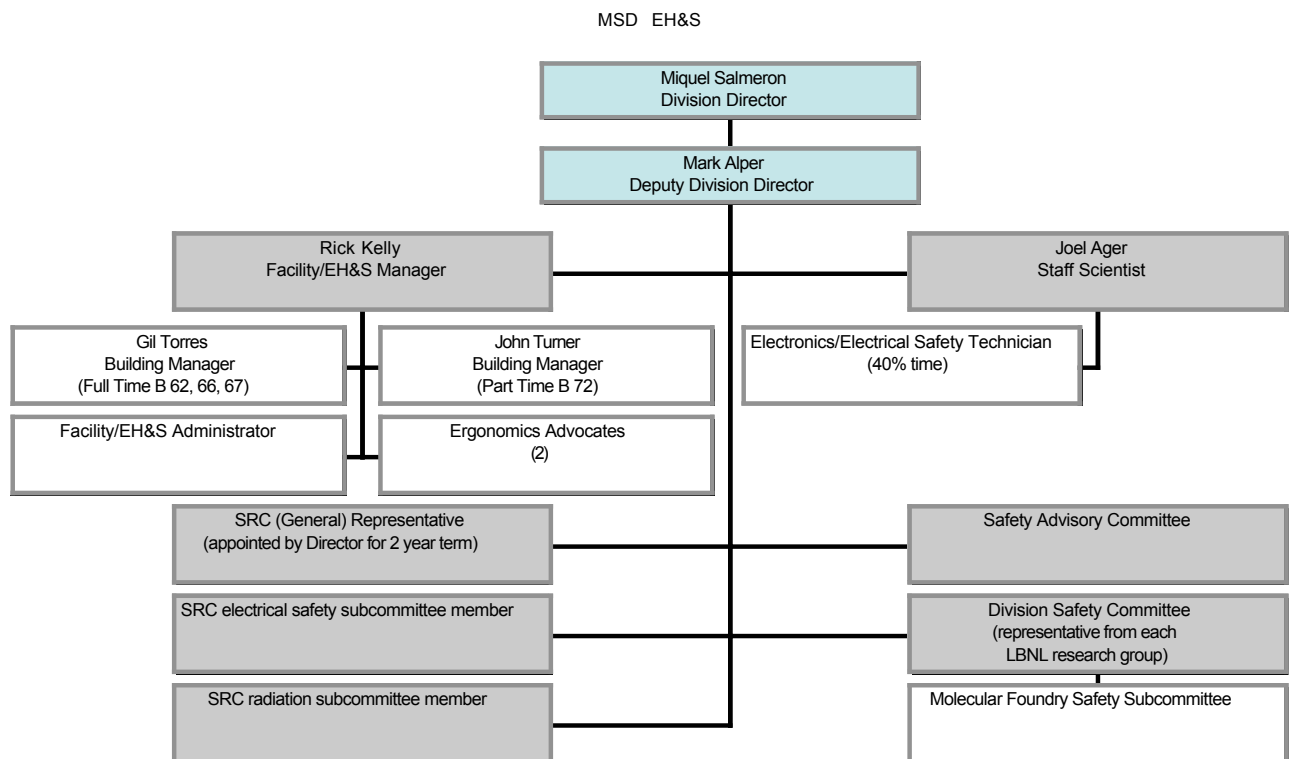
ISM Management Structure

All members of the Division have important roles in the implementation of the Integrated Safety Management program.

Key roles of the Division Director are to:

- Establish an appropriate safety culture
- Provide a set of expectations for implementation of EH&S within the Division
- Provide the required resources for implementation of the ISM plan.
- Oversee compliance with EH&S requirements

Currently, the Director of MSD provides an EH&S program support structure as shown below:



MSD receives technical support from the EH&S Division. The current individual in each position is listed.

- EH&S Division Liaison (Larry McIlouth)
- EH&S Division Waste Generator Assistant (Howard Hansen)
- Laser Safety Officer (Ken Barat)
- Electrical Safety Officer (Keith Gershon)
- Industrial Safety (Mike Wisherop)
- Industrial Hygiene Monitoring (Herb Toor)
- X-ray Safety Officer (Bob Fairchild)
- Environmental permits (Robert Fox)

Responsibility and Accountability for ISM

Everyone in the Division is responsible for fulfilling specific roles in the implementation of the ISM plan. Supervisors, such as principal investigators, have additional responsibilities because they direct the work of others.

Line management responsibility for EH&S starts with the Director of LBNL, who establishes lab-wide expectations for the implementation of the ISM program. Most of the institutional EH&S policies and procedures are codified in Publication 3000, the LBNL EH&S Manual.

Within the Division, the Director and Deputy Director are responsible for implementing the institutional expectations and for developing programs and procedures specific to the work of the Division. Division-specific policies and procedures are summarized in this document, the Division ISM Plan. The Deputy Director serves as an ex-officio member of the Division Safety Committee and as chair of the Safety Advisory Committee.

Principal investigators (PI's) and supervisors are responsible and accountable for implementation of this ISM plan in their labs and workplaces. PI's and supervisors may designate one or more "lab safety coordinator" to assist in the implementation of the ISM plan and serve as a point of contact for EH&S issues. Guests and users may not be so designated without the approval of the Division EH&S Manager. However, while activities can be delegated, the ultimate responsibility for implementing the ISM program cannot be delegated below the level of PI/supervisor.

Principal Investigator's EH&S Responsibilities

The term "Principal investigator" as used herein refers to Division scientists who *both* have "PI status" *and* manage projects involving other scientists, technicians, postdocs or students. "PI status" is conferred by the Division Director

All Principal Investigators (LBNL and UCB-based) are responsible and accountable to the Division Director for ensuring that all activities in their labs and related areas are carried out in a safe manner and in accordance with all Laboratory or UCB EH&S requirements, as appropriate. PI's are responsible for ensuring that a range of EH&S functions are performed, including:

- Ensuring EH&S requirements are integrated into all work activities and the necessary resources/controls are provided in a timely manner to do the work safely
- Creating and communicating meaningful EH&S expectations consistent with the LBNL and MSD ISM programs and holding staff, students and guests accountable for implementing these expectations.
- Using the JHA or other approved system, identifying the EH&S training and other requirements and medical surveillance requirements for their staff, students, guests and vendors and ensuring that training and medical evaluations are completed in a timely manner.

- Conducting periodic safety walkthroughs of labs, offices and other workplaces for which they are responsible to identify problems in the facilities, equipment or work practices.
- Identifying and promptly correcting hazardous conditions or practices
- Participating in scheduled lab inspections with the MSD EH&S Technician (LBNL only) and annually with the Division EH&S Manager and EH&S Liaison (campus and LBNL).
- Preparing, maintaining and renewing required Formal Authorization Documents
- Managing the accumulation, storage and disposal of hazardous waste
- Ensuring that new or significantly modified projects or facilities are reviewed for hazards in the planning stage.
- Conducting periodic safety meetings with supervised staff, students and guests.
- Designating the following:
 - Representative/back up for the Division Safety Committee (LBNL only)
 - Managers/backups for all Satellite Waste Accumulation Areas (SAAs)
 - Lab Safety coordinators, as necessary
 - Crane managers, as necessary
- Identifying equipment or processes that may pose safety concerns and thus require specific “on the job training”. Each such operation/equipment must be inventoried and a list of persons who have received the required training and thus are authorized to use the equipment must be maintained.
- Annually updating the Hazard Management System (HMS) database; continuously updating the Chemical Management System (CMS) database as new chemicals are received or disposed of; maintaining an inventory of all class 3b or 4 lasers in the Laser Inventory Database; promptly correcting deficiencies that have been entered into the Corrective Action Tracking (CATS) database
- Ensuring that new staff and students, or people who have moved their offices, perform an ergonomics self-assessment (EHS059) and receive, as necessary, an ergonomics review by a Division Ergonomics Liaison or an EH&SD Ergonomist.

Supervisory Staff (non-scientists)

The Division includes a number of supervisors who are not classified as “principal investigators”. These include the Business Manager and the EH&S Manager. To the extent applicable, the expectations described for principal investigators apply equally to this class of supervisors.

Non-Supervisory Staff (Scientific/Non-Scientific)

The Division employs staff scientists who are not principal investigators, postdoctoral fellows, technicians and a variety of administrative and technical support personnel. These members of the Division have important roles in the implementation of the ISM plan, including:

- Completing the JHA to identify controls, updating it at least annually, or whenever the nature of their work changes
- Completing required formal training and on the job training
- Identifying when new work may require formal authorization, and discussing this with their supervisor before proceeding.

- Correcting or reporting EH&S problems they identify
- Insisting that their co-workers comply with applicable safety requirements
- Discussing all new work with their supervisor
- Complying with LBNL and Division EH&S programs
- Participating in required meetings to which they are invited
- Reporting injuries or near misses

Students

With respect to ISM, the Division ISM plan does not distinguish between students and other personnel working in the Division. Students are afforded the same protections and assume the same obligations with regard to EH&S as other non-supervisory personnel at LBNL. Students must complete the same EH&S classes as staff.

Vendors

All vendors technicians performing “hands-on” work at LBNL are required to complete the Subcontractor Job Hazards Analysis form and meet with the MSD EH&S Manager or EH&S Technician and the managing scientist or technician, to review the document before beginning work. The vendor technician(s) are issued a permit once they have demonstrated that they can meet LBNL and MSD EH&S expectations. As part of the process, subject matter experts in EH&S may be consulted and the need for any formal work authorization is identified and addressed. The permit is good for up to a year as long as the work is conducted by the listed technician(s) and the work scope has not changed. Multiple sites within the Division can be listed on one permit if the work is the same.

Both the laboratory scientist and the Principal investigator or his/her designee requesting the vendor work are responsible for ensuring that the permit is issued when needed and for periodically inspecting the contractors work to assure that the stipulations on the permit are met.

Permits are not required for work that is not “hands-on” such as training, attending meetings and giving or attending seminars.

MSD independently developed this process in 2007, but as of January 1, 2009, all of LBNL will be implementing an institutional vendor permitting system based on the MSD model. MSD now conforms to the institutional requirements as specified in Pub3000, Chapter 31.

Matrixed Employees/Employees Working in MSD Facilities

“Matrixed” employees’ supervisors from the home divisions retain most health and safety responsibilities for their employees, except where some of the responsibilities have been transferred to the Division through a formal Memorandum of Understanding or as stated herein.

MSD personnel will provide operation-specific training to matrixed individuals, perform hazard assessments of their work in the Division and include these personnel in Division-

specific EH&S training and meetings. The home Division is responsible for managing the JHA process, ergonomics reviews and investigating incidents and accidents for matrixed personnel. Division managers may be assigned as “work leads” within the JHA system for the activities performed by matrixed personnel in MSD, at the discretion of the line manager and the matrix supervisor.

Shared Lab Space and User Facilities

The scientists responsible for lab facilities at *both* LBNL *and* on the UCB campus that are shared with individuals outside his or her research group are responsible for ensuring that the guest/user has been fully trained and complies with applicable EH&S policies.

The principal investigator or designee may provide required “on the job training” or others may provide this training, but it is the principal investigator’s responsibility to prohibit work from proceeding until training has been completed. This applies equally to user facilities and similar facilities managed by the Division (NCEM, Molecular Foundry, crystal growth lab, CXRO) and labs that are informally shared. In general, the Division requires guests to follow the same EH&S procedures and requirements as staff and students.

All new work at LBNL including work in user facilities or shared labs must be reviewed and authorized via the JHA system. One way to do this for shared facilities is for the line supervisor to designate the PI of the shared lab as the “work lead” within the JHA database. This then allows the lab manager to review and authorize the individual’s new scope of work in the shared lab. Alternatively, the line supervisor can authorize this new scope of work after verifying with the lab manager that all prerequisites for work have been met.

Facility/EH&S Manager

The Division Facility and EH&S Manager evaluates and implements current and new ISM policies and procedures after receiving input from Division management, the Safety Committees, principal investigators and staff. A graphic overview his primary EH&S activities in the Division is provided in Appendix 1. He also supervises the full time Building Manager, the EH&S Technician and one administrative assistant, and reports to the Deputy Division Director.

Building Managers

MSD manages buildings 62, 66, 67 and 72, and shares the management of building 2. A full time building manager provides a range of support activities in buildings 62, 66 and 67. The Division Facility/EH&S Manager supervises the full time Building Manager. The building manager:

- Manages the emergency response teams for all 5 buildings
- Manages minor building modification, equipment installation and maintenance activities
- Serves as the emergency response leader in the event of evacuation of building 62, and backup in this role for buildings 66 and 62
- Tracks and arranges for correction of building-related EH&S deficiencies

He also manages the emergency response team organization and training for B 2 and 72 but is not involved in emergency response actions in those facilities. Part time building managers provides additional support in buildings 72 and 2, including managing evacuation and emergency response.

EH&S Technician

The EH&S Technician reports to the Facility and EH&S Manager. He carries out a range of planned and ad hoc activities in support of the implementation of the EH&S program in the Division, such as:

- Semiannual inspections of LBNL labs with PIs
- Chemical management, SAA management, peroxidizable solvent management inspections
- Electrical safety inspections with the EH&S SME and the Division Electronics Technician
- Tracking of deficiencies in CATs and working with scientists and others to make required corrections
- Tracking of the updating of AHDs
- Management of the ergonomics assessments carried out by Division Ergo Advocates
- Representing the Division in meetings and at presentations

Electronics Technician

The Division Electronics Technician (ET) is a part time (40%) position reporting to a Division Principal investigator. The ET provides a range of support for the Division, including:

- Participating in electrical safety inspections in laboratories
- Identifying home-made and unapproved electrical equipment
- Inspecting and approving or repairing home made, damaged or unapproved equipment
- Providing electronics repair for scientific operations
- Representing the Division in the Electrical Safety Subcommittee of the SRC

Off-Site Work

Other than on the UC Berkeley site, as of this time MSD performs no off-site work where the Division retains control of the EH&S hazards and controls. Any off-site work, e.g. at other national laboratories or light sources, falls under the ISM program, policies and procedures of that institution. Provisions for work on the UCB campus are addressed throughout this document, where applicable.

Telecommuting

At this time, the Division does not have any specific policy on telecommuting. In the event that this is necessary, policy will be determined on a case-by-case basis. Where it is consistent with the business interests of the Division, it is expected that telecommuting will be authorized, especially for limited durations due to extenuating circumstances. This is not a common practice in the Division.

Assurance Mechanisms

The Division has implemented a variety of EH&S assurance mechanisms, as described below.

EH&S Component of Performance Appraisal

LBNL staff scientists receive annual performance appraisals. At least 10% of their performance evaluation is based on their EH&S performance, including their performance in inspections, assessments and reviews conducted during the appraisal year.

One-On-One Meetings with New Students, Postdocs and Staff

The Division Facility/EH&S Manager meets briefly with each new staff member, GSRA student and post doc working for MSD at LBNL to review their planned work, the answers to the JHQ and discuss the LBNL ISM program. This does not apply to guests, users or students working exclusively in UCB laboratories.

Affirmation

All PI's (LBNL and UCB) confirm their EH&S responsibility at least annually through their signature on the MSD Safety Assurance Statement (SAS) which is required for all proposals processed through MSD. The text of this document to be used in 2009 is provided below.

I have reviewed the impact of the component of the research described in this proposal that will be performed in my laboratories under my direction on the environment and on the health and safety of the staff, students and visitors who will do the work. I certify the following:

1. Proper procedures, equipment, and facilities will be employed and all staff will complete the LBNL Job Hazards Analysis process and be properly trained to carry out this work in a safe and environmentally benign manner. In determining that all the procedures, permits, authorizations, and/or approvals required for my new and ongoing projects are in place. I consulted with an EH&S Professional, LBNL Pub 3000, the MSD PI Safety Guide, or UCB safety guidelines as appropriate.

A. **Research in LBNL Main site laboratories.** For all my research projects, regardless of funding source, that are pursued in LBNL space: I have personally inspected all of the laboratory space under my direction and have given a safety presentation to all of the staff, students, and visitors under my supervision at least once in the past year and will do so at least once in the coming year. I have met with each person working in the lab and reviewed their individual JHA and training records to ensure that they are accurate and up to date.

B. **Research in UCB laboratories** For all my research projects that are funded through LBNL and pursued in UCB space: I or my designee has personally inspected all of the laboratory space under my direction at least once in the past year using the appropriate checklist for my UCB department and have ensured that the completed checklist has been submitted to the appropriate UCB Department Safety Coordinator with a copy sent to the MSD EHS Administrator. This will be completed at least once in the coming year. I have met with each person working in the lab and reviewed their individual JHA and training records to ensure that they are accurate and up to date

Calendar of Routine EH&S Activities

The Division has developed an annual calendar scheduling 10 routine EH&S activities for labs. Every month, PI's are asked to conduct 1-3 targeted EH&S activities, such as inspecting their waste accumulation areas, reviewing staff and student training or verifying their chemical inventory. The MSD EH&S Administrator sends PI's (and SAA managers, as appropriate) monthly notices regarding the activities scheduled for that month. Use of this tool is voluntary and at the discretion of the PI.

Inspections and Assessments

Technician/Principal Investigator Inspections

Twice a year the MSD EH&S Technician will perform a laboratory inspection with the principal investigator. The inspection will evaluate new work, laboratory changes and work practices. The technician will document these joint inspections and track items that cannot be immediately corrected in the CATS database.

Waste Accumulation Area Inspections

The EH&S Waste Generator Assistant and the MSD EH&S Technician will conduct a quarterly comprehensive review of the satellite waste accumulation areas in the Division. The Waste Generator Assistant and the EH&S Technician inspect the building 62 waste accumulation area weekly.

Annual Self-Assessment Inspection

At least annually, the MSD EH&S Manager, EH&S Liaison (LBNL or campus, as appropriate) and the PI will conduct a joint inspection of each laboratory (LBNL and UCB). For LBNL labs the EH&S Manager will document these joint inspections and track items that cannot be immediately corrected in the CATS database. For campus labs, the Campus Office of Environment, Health and Safety will track issues identified during inspections.

Triennial Management of Environment, Safety and Health Assessment (MESH)

As required by the SRC, the Division will participate in the MESH review that evaluates management systems and implementation of ISM requirements. This review is run by the Safety Review Counsel and typically includes representatives from the Office of Contract Assessment (OCA) and EH&S Division. MSD completed the MESH review in 2006.

Program Reviews

The EH&S Division is developing a program review process to examine specific safety topics in details. Examples would be laser safety, electrical safety and crane safety. MSD will participate in this review program as requested.

Training

LBNL Policy generally allows:

- New employees, participating guests and students to work for up to 30 calendar days without completing required institutional training unless the training is required by a formal authorization document and do not need to fill out the Job Hazards Analysis (JHA) questionnaire.
- Employees, Guests, Students, Contractors with appointments of 30 calendar days or less are not required to complete most institutional EH&S training and do not need to fill out the Job Hazards Analysis (JHA) questionnaire.
- “Occasional Guests, Students and Contractors” are not required to complete institutional training but must be under constant supervision by a trained individual.
- Training specified in formal authorization documents must be completed prior to starting work.

MSD has a somewhat different policy for training:

- Participating guests (including users at the Molecular Foundry and National Center for Electron Microscopy) who work at LBNL for fewer than 7 continuous days may do laboratory work without LBNL training or completion of the JHQ but only under the continuous line-of-sight supervision of someone who is trained for that work.
- New staff, students and post docs are allowed to work under line-of-sight supervision for 7 days prior to training or completing the JHA.
- Due to the limited availability of the EHS0604 “Hazardous Waste Generator” class, all people new to LBNL may generate hazardous waste for 30 days by completing EHS0623, “Hazardous Waste Generator for Guests”. After 30 days they must complete EHS0604 to continue generating waste.
- This 7 day grace period does not apply to all training, although the EH&S Division has not yet clearly defined this distinction in most cases. By Division policy this 7 day “line of sight” proviso does not apply to:
 - EHS 250 series electrical safety classes in the EHS250 series
 - EHS274, 275 and 277 in the confined space series
 - EHS310-315 in the respiratory protection training
 - EHS410-418 X-ray machine safety for operators, supervisors and maintenance personnel
- After 7 days all individuals must complete the JHA to facilitate the identification of training requirements and must complete the required training prior to starting/continuing work for which training is required.
- The supervisor may wave training classes subject to the 7-day grace period by providing substantial evidence to the MSD EH&S Manager demonstrating that the individual has equivalent training at another institution. The final decision on training class waivers is the EH&S Manager’s.
- UCB: Campus personnel must be trained to safely perform the work they will do. All campus-based students and post docs must complete the JHA. The LBNL classes that are recommended by the JHA process are available to UCB

personnel. Campus personnel may be trained by attending LBNL classes, campus classes, on-the-job training or other means deemed adequate by the principal investigator.

- NCEM: The NCEM is developing a work review and authorization process for users/guests that is distinct from the institutional JHA process. In the interim, the NCEM follows the JHA process as described for the rest of the Division and as detailed in Pub 3000 chapter 32.
- Training is available in a number of ways, including:
 - On-line at the Institutional Training Web Site (e.g., TMF010)
 - On line at the MSD web site (e.g. MSD010)
 - Via attendance at class
 - By supervisor exemption. A supervisor may exempt an employee/guest from a required training class if the employee/guest has already been trained for a particular hazard by a combination of prior experience [includes training classes taken at other institutions] and/or on-the-job training. This exemption must be proposed to the Division EH&S Manager.

Supervisor Training

Supervisors are trained through institutional and Division-specific processes. Supervisors, like other employees, complete the JHA process to identify appropriate EH&S controls for their work, including training. Supervisors are expected to complete all required training in a timely manner, in accordance with Division Policy described above.

In addition, supervisors receive specific training via:

- EHS026
- Laboratory inspections with the EH&S Technician (2x per year) and with the Facility/EH&S Manager (1x per year). Note that this one-on-one training substitutes for completion of the institutional EHS 27 inspection training class.
- Periodic peer-to-peer training sponsored by the Division
- Presentations at the PI all hands meeting in August
- Written communication, including the PI Guide to EH&S

Work Lead Training

Work leads are required to identify themselves as such in the JHA system and to complete institutional training EHS 033.

Medical Surveillance

Few MSD personnel are required to participate in a medical surveillance program. The exceptions at this time are:

- Laser Eye exam (EHS 280): Must be completed prior to working on a class 3b or 4 laser system unless under direct line-of-sight supervision by a PI or fully qualified individual designated by the PI. Must be completed within 30 days of starting work with a class 3b or 4 laser system even if fully supervised

- Respiratory protection medical review: Must be completed prior to starting work where a respirator is required.
- Starting in 2009, MSD will participate in the incipient Unbound Nanoparticle Worker baseline medical exam program.

Communication and Feedback

MSD employs a variety of tools to facilitate communication of EH&S issues and feedback.

- Materials Safety—A short safety bulletin addressing a single, timely EH&S issue or accident. Members of the Safety Committee are asked to bring topics to the attention of the EH&S Manager for consideration as an edition of Materials Safety. Suggestions may also come from any Division employee, student or guest. This serves much the same purpose as the institutional “Lessons Learned” system, but with a much quicker turn around and tailored specifically for the Division
- Division Safety Committee—Representatives from all LBNL-based research groups attend a quarterly Division Safety Committee meeting to review Division EH&S performance and incidents, discuss problems and support the self assessment process. They are required to return to their group and present, at the next group meeting, the key points they have learned at the safety committee meeting. The committee is chaired by the Facility/EH&S Manager and includes the Deputy Director (*ex officio*), the EH&S Technician, the Electrical safety technician, building managers and the liaisons from the EH&S Division.
- Molecular Foundry Safety Subcommittee—Drawn from the Division Safety Committee, the subcommittee includes representatives from each Foundry program. It meets on an *ad hoc* basis. Members are required to return to their group and present, at the next group meeting, the key points they have learned at the safety committee meeting.
- Research Group Meetings—Each PI meets with members of his or her research group and EH&S topics must be discussed in detail at least quarterly. Safety must be discussed briefly at the start of *all* group meetings. At least annually, the EH&S Manager will attend one of these group meetings to facilitate the safety discussion
- EH&S News Boards—Glass-enclosed bulletin boards dedicated to EH&S issues have been installed strategically in MSD-managed buildings (2, 62, 66, 67, 72, total of 16 cabinets). These are used to post timely EH&S information such as the monthly schedule of EH&S activities and recent editions of Materials Safety.
- Annual PI meeting—A review of Division EH&S performance and prospective look at initiatives for the coming year is presented at the Division Strategic

Planning Meeting every year. All Division PI's are required to attend this important meeting.

- Review of accidents and near misses –MSD initiated a program to elicit the reporting of “near hits (misses)”, review them in detail and inform all members of the division in a manner that will decrease the likelihood of another, similar event occurring. The discussion is fully positive in nature—focused on learning from earlier mistakes rather than on punishing those involved. To this end, management works collaboratively with other Division staff to investigate and remediate as appropriate. The Facility/EH&S Manager manages the reporting and investigation process for near misses. In the fall, the Division holds a meeting for all Division students and postdoctoral staff members. In this meeting the EH&S Manager reviews the EH&S performance in the prior years, including injuries, near misses and other incidents. A monetary award is given to the most useful reported “near miss”, as determined by audience applause. The near misses are also discussed at a variety of other divisional meetings and are the subject of posters that are prominently displayed throughout the Division.

A small fraction of accidents do result from what can reasonably be considered unacceptable behaviors including willful violations of rules or policy, repeated accidents with a consistent pattern of problems over an extended period of time, or reckless behavior. If after a thorough investigation, it is determined that an accident or near miss is the result of unacceptable behavior, disciplinary action may be taken.

- Occurrence Reporting: The Facility/EH&S Manager serves as the Occurrence Reporting Officer for the Division as required in Pub3000 section 15.2.2. He reviews all incidents and injuries against criteria stated in Chapter 15 to determine if they are reportable to the Department of Energy as an “Occurrence report”. He determines reportability after discussion with Division Management and the EH&S Division ORPS SME, prepares the initial and follow up reports and tracks issues in the CATS database to completion. If appropriate, he will initiate an internal “Materials Safety” informing Division personnel of key issues pertaining to reported incidents.
- Annual Self-Assessment: The Division participates in the annual self-assessment process, as described in LBNL Publications 5344 and 3105. Key findings are relayed to Division Management and other Division supervisors and serve to inform Division ISM policy. Findings are presented to the Safety Committee for discussion at the next meeting.

Emergency Response

The Division manages the emergency response self-help capability in buildings 62, 66, 67 and 72, and shares this responsibility with the ALS and CSD in building 2 on a rotating basis.

The MSD building manager plays a key role in this, he:

- Manages the roster and training of emergency response teams for all 5 buildings
- Serves as the emergency response leader in the event of evacuation of building 62, and backup in this role for buildings 66 and 67

Emergency response in building 67 is lead by the Facility/EH&S Manager; in building 66 it is lead by the EH&S Technician; in building 72 it is lead by the part time building manager; in building 2 it is lead by a representative from Chemical Sciences Division (this rotates annually between MSD, CSD and ALS). The EH&S Manager, EH&S Technician and Building Manager provide backup support for each other.

The goal is to have at least two emergency team members sweep each floor in the event of an evacuation or emergency. Each team member reports to the emergency response leader after sweeping their assigned floor to identify injured or trapped individuals.

The emergency response leader is the single point of contact for the evacuation and reoccupancy of their assigned building. Each emergency response leader is assigned a walkie-talkie radio for communication with the LBNL ERC and among the MSD emergency response leaders. For multi-building evacuations, the Facility/EH&S Manager coordinates the emergency response effort in buildings 62, 66,67 and 72.

Reporting Employee Concerns

All Division personnel are strongly encouraged to report EH&S questions, concerns, near misses and accidents. Issues are typically referred to the Facility and EH&S Manager, the EH&S Technician, the safety committee representative or the Deputy Director. The Division is very proud that most members report that they feel comfortable reporting EH&S issues and that support from the Division is viewed positively. The Division has established an environment of trust and mutual respect, and the EH&S Manager is viewed as a resource rather than a “cop”.

Most LBNL-based personnel also know one or more individual from the EH&S Division to whom they can address problems. Also, anonymous reporting is made available through a variety of Institutional mechanisms such as the suggestion box at <http://ehswprod.lbl.gov/mis/suggestions/suggestionsForm.asp>.

As described elsewhere, there is a near miss incentive reporting program that has been quite successful.

Institutional EH&S Databases

MSD actively participates in the management of Division data in the following institutional EH&S Databases:

- Chemical Management System (CMS)

- Supervisors Accident Analysis Report (SAAR)
- Hazard Management System (HMS)
- Corrective Action Tracking System (CATS)
- Job Hazards Analysis (JHA)
- Laser inventory Database
- Activity Hazard Document database (AHD)

Authorization of Work

Formal Authorization

A relatively large number of Division operations are “formally authorized” via Activity Hazard Documents (AHDs), X-Ray Authorizations, Human Subjects approvals or other institutional mechanism. These authorizations are contracts between the PI, the Division and the institution that bind the PI to a set of safety conditions and requirements. These contracts are inviolate; if the PI or others working in the lab cannot meet the conditions of the work authorization then work must be suspended until changes can be made in the work, controls or authorization document.

PI’s are responsible for recognizing when they are planning work that requires formal authorization and obtaining that authorization prior to starting work. The institutional triggers for formal work authorization can be found in Pub3000 and the MSD Project Hazard Guide.

Individual principal investigators prepare AHDs. Principal investigators may appoint work leaders to assist in the preparation and maintenance of their AHDs, but they may not delegate their responsibility for these actions. AHDs are initially authorized by the Division Director and annually reauthorized by the Facility/EH&S Manager. If the scope of work changes substantially, resulting in increased hazards, the EH&S Manager may, at his discretion, request the Division Director to reauthorize the AHD. All AHDs will be transferred to the on-line AHD database before the end of FY07.

Maintenance of formal work authorizations is the responsibility of the PI. The PI must update his or her AHDs at least annually or immediately whenever the work changes such that new personnel or hazards are involved. All researchers, including users and guests participating in research that is authorized via an AHD must be added to the electronic AHD before starting work (does not apply if the guest is not actually performing potentially hazardous work; does not apply for up to 7 days during which the user is under line-of-sight supervision by a trained individual). For the radiological authorizations (other than X-Ray), it is necessary to notify EH&S in advance of new or short-term users, guests or students.

The described LBNL processes for formal work authorization apply to all LBNL-based Division operations. On the UCB campus, similar work review and authorization mechanisms exist for use of radioactive materials, x-ray generating equipment, biohazardous work, work with class 3b and 4 lasers and toxic gases. These are managed

by the principal investigators working on campus, the campus Office of EH&S and other campus systems and resources.

Line Management Authorization

Work that falls below the threshold for formal authorization is authorized by the principal investigators/supervisors via the institutional Job Hazards Analysis (JHA) process. *This applies to all Division work, including that performed on the UCB campus and at the Molecular Foundry.* This is implemented in accordance with chapter 32 of Pub3000.

There are a variety of “JHA work groups” that have been developed in the Division, at least one for each LBNL Principal Investigator’s work, with the exception of the Facilities (NCEM, CXRO, Foundry), which are organized according to work in the facilities.

LBNL policy allows broad latitude in determining which hazards are identified in the “work groups” and which hazards are identified only in individual JHAs. In most cases, the supervisor chose to include hazards in work group JHAs if the hazard was “generally applicable to most people” in their lab. In at least one case, the supervisor decided to exclude almost all hazards from the work group. As stated above, the individuals working in that group are required to identify the hazards they will face when they complete their “individual JHAs”, consistent with LBNL policy.

Although MSD requires campus personnel to complete the JHA process, “work groups” are not required, although a number of Division PIs have established work groups to facilitate the process. The result of the JHA process for campus-only personnel is a list of recommended training and controls. The Supervisor is required to implement this list of controls or to implement equivalent controls, including training, from an alternative sources.

User Facilities

The Division manages two large user facilities, the Molecular Foundry and the National Center for Electron Microscopy. In addition, the Center for X-Ray optics operates much like a user facility and a new crystal growth user facility is just coming on line in building 64.

Implementation of effective ISM plans in user facilities is a challenge, due to the rapidly changing work and guests. Guests bring with them a variety of training and cultural attitudes with regard to safety and may propose work that falls outside the authorization envelope for the facilities. A specific ISM implementation program has been established for the Foundry and one is under development for the NCEM, as described below.

A. The Molecular Foundry

Each user proposal to the Molecular Foundry is screened twice to identify EH&S issues and requirements. As part of the initial proposal submission process, the prospective user

answers 7 key EH&S questions that pertain to high hazard activities. This allows the identification of proposed work that falls outside of the safety envelope of the facility or that will have significant cost or administrative impacts. The Foundry Proposal Submission Database performs this screening automatically, referring proposals that include a “yes” answer to any of the screening questions to the Division EH&S Manager. Scientific review of the proposal cannot proceed until the EH&S manager indicates that the work is feasible at the Foundry.

Accepted proposals go through a second, comprehensive EH&S review intended to identify appropriate formal authorization requirements, equipment reviews, additional engineering or personal protective controls and the need for government permits. Users who will work at LBNL are required to complete the JHA process and identified training, subject to the specifications described in LBNL Publication 3000 chapter 32.

The Foundry scientist responsible for each accepted proposal will authorize the work to proceed only after all of the requirements identified in this EH&S review have been implemented. Authorization of work is performed via the institutional JHA system, and the supervisor’s authorization is contingent on the completion of specified training or working with trained Foundry personnel as specified in LBNL Publication 3000 chapter 32.

Prior to starting work in the Foundry, all users and guests must complete the on-line training class TMF010, “Integrating EH&S into Science at the Molecular Foundry”. All users of class 3b and 4 lasers must complete the institutional laser training prior to working directly with lasers in the Foundry.

B. The National Center for Electron Microscopy

The NCEM is in the process of implementing an alternative to the JHA process for training of users/guests and analysis of their work. Until this is approved by LBNL, the NCEM will continue to utilize the JHA system for work review and authorization.

All members of the NCEM share safety responsibilities and are integrated within the safety management plan. Some NCEM staff members, as hosts, have been identified as line management for users with respect to safety. A user might have one or more such line managers depending on the number of instruments (s)he might use. Line management safety responsibilities for the NCEM users are implemented through individual “NCEM Safety Control Forms”. Key functions of the NCEM Safety Control Form are (1) assurance of compliance with basic training requirements, (2) assessment of potential hazards unique to the particular user’s project.

Completion of the “NCEM Safety Control Form” is linked with completion of the web-based safety-training course NCM1001 and allows for appropriate signature blocks indicating the acceptance of appropriate safety responsibilities by staff and users. NCM1001 highlights the standard functions of ISM, covers the safety procedures as applicable in common user projects, and provides links to additional training courses for

users whose work introduces additional hazards (for example, users wishing to investigate nano-particulate material may be required to take additional training). Once approved by the institution, this process will supplant the JHA process for NCEM operations.

MSD EH&S Safety Program Elements Chart

